

CPC**COOPERATIVE PATENT CLASSIFICATION****F22D****PREHEATING, OR ACCUMULATING PREHEATED, FEED-WATER ;
FEED-WATER SUPPLY ; CONTROLLING WATER LEVEL ; AUXILIARY
DEVICES FOR PROMOTING WATER CIRCULATION WITHIN BOILERS**

(chemical treatment of water, e.g. purification, C02F ; enclosed heat-exchange apparatus in general F28D ; controlling in general G05)

F22D 1/00**Feed-water heaters, i.e. economisers or like preheaters**

F22D 1/003

- . {Feed-water heater systems ([F22D 1/325](#), [F22D 1/36](#) and [F22D 1/40](#) take precedence)}

F22D 1/006

- . {with heating tubes ([F22D 1/24](#) takes precedence)}

F22D 1/02

- . with water tubes arranged in the boiler furnace, fire tubes, or flue ways ([heat-exchange tubes in general F28F](#))

F22D 1/04

- .. the tubes having plain outer surfaces, e.g. in vertical arrangement

F22D 1/06

- ... in horizontal arrangement

F22D 1/08

- .. the tubes having fins, ribs, gills, corrugations, or the like on their outer surfaces, e.g. in vertical arrangement

F22D 1/10

- ... in horizontal arrangement ([hollow fire-bars, grates, or the like used as water tubes F23H 3/02](#))

F22D 1/12

- .. Control devices, e.g. for regulating steam temperature

F22D 1/14

- .. Safety or venting devices ([safety devices for boilers in general F22B 37/42](#))

F22D 1/16

- . with water tubes arranged otherwise than in the boiler furnace, fire tubes, or flue ways

F22D 1/18

- .. and heated indirectly

F22D 1/20

- .. and directly connected to boilers

F22D 1/22

- .. and provided for rotary movements

F22D 1/24

- . with fire tubes or flue ways traversing feed-water vessels

F22D 1/26

- . with means, other than tubes, to separate water and heating medium, e.g. bulk heaters without internal flues or tubes, jacketed smoke-boxes or flue or flues

F22D 1/28

- . for direct heat transfer, e.g. by mixing water and steam

F22D 1/30

- .. with stages, steps, baffles, dishes, circular troughs, or other means to cause interrupted or cascading fall of water ([de-aeration apparatus C02F](#))

F22D 1/32

- . arranged to be heated by steam, e.g. bled from turbines

F22D 1/325

- .. {Schematic arrangements or control devices therefor}

F22D 1/34

- .. and returning condensate to boiler with main feed supply

F22D 1/36

- . Water and air preheating systems

- F22D 1/38 . . . Constructional features of water and air preheating systems
- F22D 1/40 . . . Combinations of exhaust-steam and smoke-gas preheaters ([for locomotives F22D 1/42](#))
- F22D 1/42 . . . specially adapted for locomotives
- F22D 1/44 . . . Smoke-gas preheaters
- F22D 1/46 . . . Exhaust-steam preheaters
- F22D 1/48 . . . Details
- F22D 1/50 . . . incorporating thermal de-aeration of feed-water (de-aeration produced in the course of direct heat transfer [F22D 1/28](#); thermal de-aeration of water per se [B01D 19/00](#), [C02F 1/20](#); valves for venting [F16K 24/04](#))
- F22D 3/00 Accumulators for preheated water**
- F22D 3/02 . . . arranged within combustion chambers
- F22D 3/04 . . . combined with steam accumulators
- F22D 3/06 . . . directly connected to boilers
- F22D 3/08 . . . specially adapted for locomotives ([locomotives boilers F22B 13/06](#))
- F22D 3/10 . . . Control devices ([controlling water feed to boilers, or water level F22D 5/00](#))
- F22D 5/00 Controlling water feed or water level; Automatic water feeding or water-level regulators** ([steam traps F16T](#); [measuring or indicating instruments G01](#); [for indicating water level G01F](#); [level control in general G05D 9/00](#))
- F22D 5/02 . . . with an intermediate compartment from which the water is fed by gravity after mechanically moving the compartment, the movement being controlled according to water level
- F22D 5/04 . . . with pivoting buckets
- F22D 5/06 . . . with receptacles external to, but in free communication with, the boilers and adapted to move up and down in accordance with change in water level
- F22D 5/08 . . . with float-actuated valves
- F22D 5/10 . . . and with pistons or membranes unitary with the feed inlet valves
- F22D 5/12 . . . and with dipping tubes
- F22D 5/14 . . . responsive to thermal expansion and contraction, e.g. of solid elements
- F22D 5/16 . . . of fluids
- F22D 5/18 . . . for varying the speed or delivery pressure of feed pumps
- F22D 5/20 . . . without floats
- F22D 5/22 . . . with floats

- F22D 5/24 . with electric switches
- F22D 5/26 . Automatic feed-control systems ([automatic safety devices F22B 37/42](#); [controlling in general G05](#))
- F22D 5/28 .. responsive to amount of steam withdrawn; responsive to steam pressure
- F22D 5/30 .. responsive to both water level and amount of steam withdrawn or steam pressure
- F22D 5/32 .. influencing the speed or delivery pressure of the feed pumps
- F22D 5/34 .. Applications of valves ([valves per se F16K](#))
- F22D 5/36 .. for feeding a number of steam boilers designed for different ranges of temperature and pressure

- F22D 7/00 **Auxiliary devices for promoting water circulation** ([adaptation of boilers for promoting water circulation F22B 37/34](#))**

- F22D 7/02 . Saddles or like directing plates fitted to furnace tubes
- F22D 7/04 . Injectors for water or steam
- F22D 7/06 . Rotary devices, e.g. propellers
- F22D 7/08 .. Arrangements of pumps, e.g. outside the boilers
- F22D 7/10 ... within the boilers

- F22D 7/12 . Control devices

- F22D 7/14 . specially adapted for locomotive boilers

- F22D 11/00 **Feed-water supply not provided for in other main groups****

- F22D 11/003 . {[Emergency feed-water supply \(safety devices for boilers in general F22B 37/42\)](#)}
- F22D 11/006 . {[Arrangements of feedwater cleaning with a boiler](#)}

- F22D 11/02 . Arrangements of feed-water pumps ([F22D 11/06](#) takes precedence; pumps per se F04)
- F22D 11/04 .. with means to eliminate steam formation
- F22D 11/06 .. for returning condensate to boiler